

A Appendix

Table A1: Cumulative average abnormal returns (CAARs): Outbreak of the oil price war.

$\tau_1 = -2$						$\tau_1 = -1$				
τ_2	F1	F2	F3	F4	Spot	F1	F2	F3	F4	Spot
-2	-0.079**	-0.069**	-0.058***	-0.037***	-0.070					
-1	-0.291*	-0.238***	-0.206***	-0.145**	-0.313***	-0.212	-0.169***	-0.147***	-0.107**	-0.243
0	-0.240*	-0.190**	-0.161***	-0.109***	-0.287***	-0.162	-0.121	-0.102***	-0.072***	-0.218
1	-0.227	-0.164***	-0.133***	-0.082**	-0.272***	-0.148	-0.096***	-0.074***	-0.045*	-0.203
2	-0.182	-0.090***	-0.058***	-0.013	-0.255**	-0.104	-0.021*	0.001***	0.025	-0.185
3	-0.215	-0.134**	-0.100**	-0.058	-0.273***	-0.136	-0.065***	-0.041*	-0.020	-0.204
4	-0.230	-0.127*	-0.089**	-0.042	-0.291***	-0.152	-0.058**	-0.031**	-0.004	-0.221
5	-0.308	-0.194*	-0.143**	-0.085	-0.350***	-0.230	-0.125**	-0.084*	-0.047	-0.280
10	-0.375*	-0.175*	-0.114	-0.073	-0.502***	-0.297	-0.107*	-0.055	-0.036	-0.432**
15	-0.562*	-0.257**	-0.154	-0.099	-0.777***	-0.484*	-0.188**	-0.096	-0.061	-0.707***
$\tau_1 = 0$						$\tau_1 = 1$				
τ_2	F1	F2	F3	F4	Spot	F1	F2	F3	F4	Spot
0	0.054	0.048	0.045	0.035	0.026					
1	0.064***	0.073	0.073	0.063*	0.041	0.014	0.026	0.028	0.028	0.015
2	0.109	0.148*	0.148**	0.132***	0.058	0.058	0.100	0.103*	0.097	0.033
3	0.076	0.104*	0.106*	0.087	0.040	0.026	0.056	0.061	0.052	0.014
4	0.061	0.092***	0.117***	0.103	0.022	-0.010	0.063	0.072	0.068	-0.004
5	-0.017	0.044	0.063*	0.060	-0.037	-0.068	-0.004	0.018	0.025	-0.062
10	-0.085	0.062	0.092	0.071	-0.189	-0.135	0.015	0.047	0.036	-0.215
15	-0.272	-0.019	0.052	0.046	-0.464	-0.322	-0.067	0.007	0.011	-0.490*

Notes: The nearby, third-deferred, sixth-deferred, twelfth-deferred futures returns and the spot returns are stand for F1, F2, F3, F4, and Spot, respectively. The *t*-statistic proposed by Kolari and Pynnönen (2010) is adopted here. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table A2: Cumulative abnormal returns (CARs) for WTI crude oil markets: Outbreak of the oil price war.

$\tau_1 = -2$						$\tau_1 = -1$				
τ_2	F1	F2	F3	F4	Spot	F1	F2	F3	F4	Spot
-2	-0.081**	-0.072***	-0.060***	-0.037**	-0.087**					
-1	-0.275***	-0.243***	-0.205***	-0.144***	-0.291***	-0.194***	-0.170***	-0.145***	-0.107***	-0.204***
0	-0.208***	-0.183***	-0.155***	-0.105***	-0.213***	-0.127***	-0.111***	-0.096***	-0.067***	-0.126***
1	-0.204***	-0.172***	-0.139***	-0.088***	-0.213***	-0.123***	-0.100***	-0.080***	-0.050***	-0.126***
2	-0.129***	-0.090***	-0.059***	-0.019***	-0.156***	-0.048***	-0.017***	0.001***	0.018*	-0.070***
3	-0.184***	-0.150***	-0.119***	-0.079***	-0.204***	-0.103***	-0.078***	-0.059***	-0.042***	-0.117***
4	-0.168***	-0.127***	-0.094***	-0.059***	-0.194***	-0.088***	-0.055***	-0.034***	-0.022***	-0.107***
5	-0.272***	-0.211***	-0.155***	-0.102***	-0.300***	-0.191***	-0.139***	-0.096***	-0.064***	-0.213***
10	-0.372***	-0.220***	-0.153***	-0.112***	-0.523***	-0.291***	-0.147***	-0.094***	-0.075***	-0.436***
15	-0.603***	-0.275***	-0.177***	-0.117***	-0.606***	-0.522***	-0.203***	-0.118***	-0.080***	-0.519***
$\tau_1 = 0$						$\tau_1 = 1$				
τ_2	F1	F2	F3	F4	Spot	F1	F2	F3	F4	Spot
0	0.067**	0.060**	0.050**	0.040**	0.078**					
1	0.071**	0.071***	0.066***	0.056***	0.078**	0.004	0.011	0.016	0.017	0.000
2	0.145***	0.153***	0.146***	0.125***	0.135***	0.078**	0.093***	0.096***	0.086***	0.057
3	0.091***	0.093***	0.086***	0.065***	0.087**	0.024	0.033	0.037*	0.026*	0.009
4	0.106***	0.115***	0.111***	0.085***	0.097***	0.039	0.056*	0.062**	0.045**	0.019
5	0.002*	0.032**	0.050***	0.042***	-0.009	-0.064	-0.028	0.000	0.003	-0.087
10	-0.09	0.023**	0.052***	0.032***	-0.232	-0.165**	-0.037	0.002	-0.008	-0.310***
15	-0.328	-0.032	0.028***	0.027***	-0.315	-0.395***	-0.092	-0.022	-0.012	-0.393***

Notes: The nearby, third-deferred, sixth-deferred, twelfth-deferred futures returns and the spot returns are stand for F1, F2, F3, F4, and Spot, respectively. The t -statistic proposed by Patell (1976) is adopted here. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table A3: Cumulative abnormal returns (CARs) for Brent crude oil markets: Outbreak of the oil price war.

$\tau_1 = -2$						$\tau_1 = -1$				
τ_2	F1	F2	F3	F4	Spot	F1	F2	F3	F4	Spot
-2	-0.079***	-0.068***	-0.057***	-0.036**	-0.096***					
-1	-0.283***	-0.233***	-0.202***	-0.147***	-0.274***	-0.205***	-0.165***	-0.145***	-0.111***	-0.179***
0	-0.229***	-0.178***	-0.152***	-0.109***	-0.294***	-0.150***	-0.110***	-0.095***	-0.073***	-0.199***
1	-0.232***	-0.152***	-0.121***	-0.081***	-0.287***	-0.153***	-0.084***	-0.065***	-0.045***	-0.192***
2	-0.210***	-0.087***	-0.054***	-0.023***	-0.288***	-0.131***	-0.019***	0.003***	0.013**	-0.193***
3	-0.240***	-0.135***	-0.104***	-0.073***	-0.302***	-0.161***	-0.067***	-0.047***	-0.037***	-0.206***
4	-0.266***	-0.139***	-0.099***	-0.061***	-0.344***	-0.187***	-0.070***	-0.042***	-0.025***	-0.248***
5	-0.344***	-0.204***	-0.153***	-0.105***	-0.379***	-0.265***	-0.136***	-0.096***	-0.069***	-0.284***
10	-0.381***	-0.170***	-0.123***	-0.099***	-0.489***	-0.302***	-0.102***	-0.066***	-0.063***	-0.393***
15	-0.616***	-0.266***	-0.172***	-0.130***	-1.049***	-0.537***	-0.198***	-0.115***	-0.094***	-0.954***
$\tau_1 = 0$						$\tau_1 = 1$				
τ_2	F1	F2	F3	F4	Spot	F1	F2	F3	F4	Spot
0	0.054**	0.056***	0.050***	0.038**	-0.020					
1	0.051**	0.081***	0.080***	0.065***	-0.013	-0.003	0.026	0.030	0.027**	0.007
2	0.074***	0.146***	0.148***	0.123***	-0.014	0.020	0.090***	0.098***	0.086***	0.006
3	0.043*	0.098***	0.098***	0.074***	-0.028	-0.011	0.042*	0.048**	0.036**	-0.007
4	0.017	0.095***	0.103***	0.085***	-0.070	-0.037	0.039*	0.053**	0.047***	-0.050
5	-0.061	0.029***	0.049***	0.041***	-0.105	-0.115**	-0.027	-0.001	0.004	-0.085
10	-0.098	0.063***	0.079***	0.048***	-0.215***	-0.152***	0.007	0.029**	0.010	-0.195**
15	-0.333***	-0.033**	0.030***	0.017***	-0.775***	-0.387***	-0.088	-0.020	-0.021	-0.755***

Notes: The nearby, third-deferred, sixth-deferred, twelfth-deferred futures returns and the spot returns are stand for F1, F2, F3, F4, and Spot, respectively. The t -statistic proposed by Patell (1976) is adopted here. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table A4: Cumulative abnormal returns (CARs) for Oman crude oil markets: Outbreak of the oil price war.

$\tau_1 = -2$					$\tau_1 = -1$					
τ_2	F1	F2	F3	F4	Spot	F1	F2	F3	F4	Spot
-2	-0.076***	-0.065***	-0.059***	-0.039**	-0.026					
-1	-0.314***	-0.237***	-0.211***	-0.143***	-0.373***	-0.238***	-0.172***	-0.152***	-0.104***	-0.347***
0	-0.284***	-0.209***	-0.176***	-0.115***	-0.354***	-0.208***	-0.144***	-0.117***	-0.076***	-0.328***
1	-0.244***	-0.168***	-0.138***	-0.077***	-0.316***	-0.168***	-0.103***	-0.079***	-0.038***	-0.290***
2	-0.207***	-0.093***	-0.060***	0.004**	-0.319***	-0.132***	-0.028***	-0.001***	0.043	-0.293***
3	-0.220***	-0.115***	-0.076***	-0.022***	-0.315***	-0.145***	-0.050***	-0.017***	0.017*	-0.288***
4	-0.255***	-0.114***	-0.075***	-0.004**	-0.335***	-0.180***	-0.049***	-0.016***	0.035	-0.309***
5	-0.308***	-0.166***	-0.120***	-0.047***	-0.369***	-0.232***	-0.101***	-0.061***	-0.009**	-0.343***
10	-0.372***	-0.135***	-0.065***	-0.008**	-0.493***	-0.296***	-0.070***	-0.006***	0.030	-0.467***
15	-0.468***	-0.230***	-0.112***	-0.049***	-0.676***	-0.393***	-0.165***	-0.053***	-0.010**	-0.649***
$\tau_1 = 0$					$\tau_1 = 1$					
τ_2	F1	F2	F3	F4	Spot	F1	F2	F3	F4	Spot
0	0.031	0.028	0.035	0.028	0.019					
1	0.070**	0.068***	0.072***	0.066***	0.057	0.040	0.041*	0.038**	0.038**	0.038
2	0.107***	0.144***	0.150***	0.147***	0.054	0.076**	0.116***	0.115***	0.119***	0.035
3	0.094***	0.121***	0.134***	0.121***	0.059	0.063**	0.094***	0.100***	0.093***	0.040
4	0.059**	0.123***	0.136***	0.139***	0.038	0.028	0.095***	0.101***	0.111***	0.019
5	0.006	0.070***	0.091***	0.096***	0.004	-0.024	0.042**	0.056***	0.068***	-0.015
10	-0.058	0.101***	0.146***	0.135***	-0.120	-0.089	0.074***	0.111***	0.107***	-0.139
15	-0.154	0.007**	0.099***	0.094***	-0.302**	-0.185	-0.021*	0.064***	0.066***	-0.321***

Notes: The nearby, third-deferred, sixth-deferred, twelfth-deferred futures returns and the spot returns are stand for F1, F2, F3, F4, and Spot, respectively. The t -statistic proposed by Patell (1976) is adopted here. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B1: Cumulative average abnormal returns (CAARs): Truce of the oil price war.

$\tau_1 = -5$							$\tau_1 = -4$							
τ_2	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)
-5	0.175**	0.195	0.063***	0.025	0.008***	0.160	0.186							
-4	0.336***	0.367	0.158**	0.088	0.043	0.323	0.358	0.161	0.172	0.094	0.063	0.035	0.163***	0.172
-3	0.203**	0.235	0.073***	0.017	-0.010	0.195	0.235	0.028	0.040	0.010*	-0.008	-0.018	0.036	0.049
-2	0.102	0.138	0.041	-0.002	-0.020	0.138	0.180	-0.073	-0.056	-0.023	-0.027	-0.028	-0.022	-0.005
-1	0.120	0.157	0.034	-0.017	-0.040	0.150	0.198	-0.055	-0.037	-0.029	-0.043	-0.047	-0.009	0.013
0	0.023	0.063	-0.011	-0.050	-0.064	0.023	0.080	-0.152	-0.132	-0.074	-0.075	-0.072	-0.137	-0.105
1	0.049	0.089	0.064**	0.024	-0.003	-0.066	-0.033	-0.126	-0.105	0.000***	-0.001	-0.010	-0.164	-0.144
2	-0.082	-0.037	-0.001	-0.021	-0.031	-0.044	0.018	-0.257	-0.232	-0.065	-0.046	-0.039	-0.203	-0.168
3	-0.076	-0.031	-0.009***	-0.033*	-0.041	-0.075	-0.014	-0.251	-0.226	-0.073	-0.058	-0.049	-0.235	-0.199
4	-0.076	-0.032	-0.017***	-0.038	-0.043	-0.098	-0.036	-0.251	-0.226	-0.080	-0.063	-0.050*	-0.257	-0.222
5	-0.116	-0.070	-0.038*	-0.054	-0.054	-0.126	-0.060	-0.292	-0.265	-0.101	-0.080	-0.061***	-0.285	-0.246
6	-0.102	-1.123	-0.089	-0.076	-0.056	-0.103	-1.092	-0.262**	-1.318	-0.152	-0.101	-0.064	-0.242***	-1.277
7	-0.288***	-1.641	-0.243	-0.186	-0.129	-0.462	-1.673	-0.449	-1.835	-0.306	-0.211	-0.137	-0.601	-1.856
10	-0.120	-1.482	-0.181	-0.198	-0.146	-0.020	-1.218	-0.295	-1.677	-0.304	-0.223	-0.154	-0.180	-1.403
15	0.053	-1.265	-0.215	-0.180	-0.128	0.295***	-1.512	-0.122	-1.460	-0.278	-0.206	-0.136	0.054	-1.792
$\tau_1 = -3$							$\tau_1 = -2$							
τ_2	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)
-3	-0.134***	-0.132	-0.085	-0.071	-0.053	-0.127***	-0.123**							
-2	-0.234	-0.229	-0.117	-0.090	-0.063	-0.185***	-0.177***	-0.101	-0.096	-0.032	-0.019	-0.010	-0.057	-0.055
-1	-0.216	-0.209	-0.124	-0.105	-0.083	-0.172***	-0.159***	-0.083	-0.077	-0.039	-0.034	-0.029	-0.045	-0.037
0	-0.314	-0.304	-0.169	-0.138	-0.107	-0.300***	-0.277***	-0.180	-0.172	-0.084	-0.067	-0.054	-0.173***	-0.155***
1	-0.287*	-0.278	-0.094	-0.064	-0.046	-0.305***	-0.290***	-0.154	-0.145	-0.009	0.007	0.008	-0.192***	-0.183***
2	-0.418*	-0.404	-0.159	-0.109	-0.074	-0.366***	-0.340***	-0.285	-0.271	-0.074	-0.038	-0.021	-0.239**	-0.217**
3	-0.412***	-0.398	-0.167	-0.121	-0.084	-0.398***	-0.371***	-0.278**	-0.265	-0.082	-0.050	-0.031	-0.270***	-0.249**
4	-0.412***	-0.398	-0.174	-0.126	-0.086	-0.420***	-0.394***	-0.279**	-0.266	-0.090	-0.055	-0.032	-0.293***	-0.271***
5	-0.453***	-0.437	-0.196	-0.142	-0.097	-0.448***	-0.418***	-0.319**	-0.305	-0.111**	-0.071***	-0.043	-0.321***	-0.295***
6	-0.438***	-1.490	-0.247	-0.164	-0.099	-0.418***	-1.449	-0.316***	-1.358	-0.162***	-0.093***	-0.046	-0.303***	-1.327
7	-0.624***	-2.007	-0.401***	-0.274***	-0.172***	-0.776**	-2.031	-0.502***	-1.875	-0.316*	-0.203	-0.119	-0.662**	-1.908
10	-0.456	-1.849	-0.398**	-0.286	-0.189	-0.343**	-1.575	-0.322	-1.717	-0.273***	-0.215***	-0.136***	-0.215	-1.453
15	-0.284	-1.632	-0.373***	-0.268	-0.171**	-0.119	-1.976	-0.150	-1.500	-0.288**	-0.197	-0.118	0.036	-1.824

Continued

$\tau_1 = -1$							$\tau_1 = 0$							
τ_2	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)
-1	0.018	0.019	-0.007	-0.015	-0.019	0.012	0.018							
0	-0.079*	-0.075	-0.052	-0.048	-0.044	-0.115	-0.100	-0.097	-0.094	-0.045	-0.032	-0.025	-0.128	-0.118
1	-0.053	-0.049	0.023	0.026	0.018	-0.124	-0.118	-0.071	-0.068***	0.030	0.041	0.037	-0.091***	-0.089***
2	-0.184***	-0.175	-0.042	-0.019	-0.011	-0.182	-0.163	-0.202**	-0.194	-0.036**	-0.003	0.009	-0.194***	-0.181**
3	-0.178**	-0.169	-0.050	-0.031	-0.021	-0.213	-0.194	-0.196***	-0.188	-0.044	-0.015	-0.002	-0.225***	-0.212**
4	-0.178***	-0.170	-0.058	-0.036	-0.022	-0.236	-0.216	-0.196***	-0.189	-0.051	-0.020	-0.003	-0.248**	-0.234**
5	-0.219	-0.209	-0.079	-0.052	-0.033	-0.264*	-0.240	-0.237	-0.228*	-0.072	-0.037	-0.014	-0.276***	-0.258**
6	-0.220	-1.261	-0.130	-0.074	-0.036	-0.278**	-1.272	-0.231	-1.281	-0.123	-0.059	-0.017	-0.281	-1.290
7	-0.407	-1.779	-0.284	-0.184	-0.109	-0.634**	-1.853	-0.418	-1.798	-0.277	-0.169	-0.089	-0.640	-1.871
10	-0.222	-1.620	-0.281	-0.196	-0.126	-0.158	-1.398	-0.240	-1.639	-0.275	-0.181	-0.107	-0.171	-1.416
15	-0.049	-1.403	-0.256	-0.178	-0.108	0.114	-1.749	-0.068	-1.422	-0.249	-0.163	-0.089	0.048	-1.821
$\tau_1 = 1$														
τ_2	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)							
1	0.026	0.026	0.075	0.074	0.062	-0.022	-0.022							
2	-0.105	-0.100	0.009	0.029	0.033	-0.066	-0.063							
3	-0.098	-0.094	0.001	0.017	0.023	-0.098	-0.094							
4	-0.099	-0.095	-0.006	0.012	0.022	-0.120	-0.116							
5	-0.139	-0.133	-0.027	-0.005	0.011	-0.148	-0.140							
6	-0.144	-1.186	-0.078	-0.026	0.008	-0.143**	-1.172							
7	-0.331	-1.704	-0.232	-0.136	-0.065	-0.502*	-1.753							
10	-0.142	-1.545	-0.230	-0.148	-0.082	-0.043	-1.298							
15	0.030	-1.328	-0.204	-0.131	-0.064	0.223	-1.660							

Notes: The nearby log-returns, nearby simple returns, third-deferred, sixth-deferred, twelfth-deferred futures returns, the spot log-returns, and the spot simple returns are stand for F1 (L), F1 (S), F2, F3, F4, Spot (L), and Spot (S), respectively. The t -statistic proposed by Kolari and Pynnönen (2010) is adopted here. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B2: Cumulative abnormal returns (CARs) for WTI crude oil markets: Truce of the oil price war.

$\tau_1 = -5$							$\tau_1 = -4$							
τ_2	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)
-5	0.204***	0.230***	0.072**	0.022	0.000	0.200***	0.225**							
-4	0.337***	0.368***	0.156***	0.080**	0.024	0.338***	0.370***	0.132***	0.138*	0.084***	0.057**	0.025	0.139**	0.145
-3	0.180***	0.215***	0.085***	0.024	-0.016	0.185***	0.218**	-0.024	-0.015	0.013	0.002	-0.016	-0.015	-0.006
-2	0.069***	0.108**	0.073***	0.020	-0.011	0.064**	0.103*	-0.135	-0.122	0.000	-0.002	-0.011	-0.135	-0.122
-1	0.102***	0.143**	0.069***	0.007	-0.026	0.095***	0.136*	-0.102	-0.087	-0.003	-0.015	-0.026	-0.104	-0.089
0	-0.017***	0.030*	0.033**	-0.018	-0.044	-0.013**	0.031	-0.221*	-0.201	-0.039	-0.040	-0.044	-0.212	-0.193
1	-0.021***	0.024*	0.082***	0.036	0.001	-0.026*	0.018	-0.225*	-0.206	0.010	0.014	0.001	-0.225	-0.207
2	-0.162	-0.110	0.028**	0.003	-0.013	-0.163	-0.115	-0.366***	-0.341	-0.044	-0.019	-0.013	-0.363**	-0.339
3	-0.143*	-0.093	-0.009*	-0.038	-0.050	-0.142	-0.094	-0.347***	-0.324	-0.081	-0.060	-0.049	-0.341**	-0.319
4	-0.145*	-0.095	-0.023	-0.050	-0.056	-0.150	-0.103	-0.349***	-0.325	-0.096	-0.072	-0.055	-0.350**	-0.328
5	-0.263	-0.210	-0.053	-0.072	-0.071	-0.265	-0.215	-0.467***	-0.440*	-0.125	-0.094	-0.071	-0.465***	-0.440
6	N/A	-3.255***	-0.129	-0.109	-0.084	N/A	-3.221***	N/A	-3.486***	-0.201	-0.131	-0.084	N/A	-3.445***
7	N/A	-4.481***	-0.366	-0.276**	-0.197***	N/A	-4.420***	N/A	-4.711***	-0.438***	-0.298***	-0.196***	N/A	-4.645***
10	0.142***	-4.099***	-0.304	-0.245*	-0.185***	0.343***	-3.758***	-0.062	-4.329***	-0.377***	-0.267**	-0.185***	0.144	-3.983***
15	0.283***	-3.874***	-0.319	-0.252**	-0.182***	0.538***	-3.480***	0.079	-4.104***	-0.391***	-0.274***	-0.181***	0.338	-3.704***
$\tau_1 = -3$							$\tau_1 = -2$							
τ_2	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)
-3	-0.156***	-0.153*	-0.071**	-0.055**	-0.040*	-0.154***	-0.151							
-2	-0.268***	-0.260***	-0.084**	-0.060**	-0.035*	-0.274***	-0.267**	-0.111***	-0.107	-0.012	-0.004	0.005	-0.121**	-0.115
-1	-0.235***	-0.225***	-0.087**	-0.073**	-0.050**	-0.243***	-0.234**	-0.078**	-0.072	-0.016	-0.017	-0.010	-0.089*	-0.083
0	-0.353***	-0.339***	-0.123***	-0.098***	-0.068**	-0.351***	-0.339**	-0.197***	-0.186*	-0.052	-0.042	-0.028	-0.198***	-0.187
1	-0.358***	-0.344***	-0.074**	-0.043**	-0.023	-0.364***	-0.352***	-0.201***	-0.191*	-0.003	0.012	0.017	-0.210***	-0.201
2	-0.498***	-0.479***	-0.128***	-0.077**	-0.037*	-0.501***	-0.484***	-0.342***	-0.326***	-0.057	-0.021	0.003	-0.348***	-0.333**
3	-0.480***	-0.462***	-0.165***	-0.118***	-0.074**	-0.480***	-0.464***	-0.324***	-0.308**	-0.094	-0.062	-0.033	-0.326***	-0.313**
4	-0.481***	-0.463***	-0.179***	-0.129***	-0.080***	-0.488***	-0.473***	-0.325***	-0.310**	-0.108*	-0.074	-0.040	-0.335***	-0.322**
5	-0.600***	-0.578***	-0.209***	-0.151***	-0.095***	-0.603***	-0.585***	-0.444***	-0.425***	-0.138**	-0.096*	-0.055	-0.450***	-0.434**
6	N/A	-3.624***	-0.285***	-0.189***	-0.109***	N/A	-3.590***	N/A	-3.470***	-0.214***	-0.133**	-0.068	N/A	-3.439***
7	N/A	-4.849***	-0.522***	-0.356***	-0.221***	N/A	-4.790***	N/A	-4.696***	-0.451***	-0.300***	-0.181***	N/A	-4.638***
10	-0.195***	-4.467***	-0.460***	-0.324***	-0.209***	0.005***	-4.128***	-0.038***	-4.314***	-0.389***	-0.269***	-0.169***	0.159	-3.977***
15	-0.054***	-4.242***	-0.475***	-0.332***	-0.206***	0.199**	-3.849***	0.103**	-4.089***	-0.404***	-0.276***	-0.165***	0.353	-3.698***

Continued

$\tau_1 = -1$							$\tau_1 = 0$							
τ_2	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)
-1	0.033	0.035	-0.004	-0.013	-0.015	0.031	0.033							
0	-0.085	-0.079	-0.039	-0.038	-0.033	-0.077	-0.072	-0.118***	-0.114	-0.036	-0.025	-0.018	-0.108*	-0.105
1	-0.090	-0.084	0.009	0.016	0.012	-0.090	-0.085	-0.123***	-0.119	0.013	0.029	0.027	-0.121**	-0.118
2	-0.231***	-0.219	-0.044	-0.017	-0.002	-0.227**	-0.218	-0.264***	-0.254**	-0.040	-0.004	0.013	-0.258***	-0.250*
3	-0.212***	-0.202	-0.082	-0.058	-0.039	-0.206*	-0.197	-0.245***	-0.237**	-0.078	-0.045	-0.023	-0.237***	-0.230*
4	-0.213***	-0.203	-0.096	-0.070	-0.045	-0.214**	-0.206	-0.246***	-0.238**	-0.092*	-0.056	-0.030	-0.245***	-0.239*
5	-0.332***	-0.318*	-0.125**	-0.092*	-0.060	-0.329***	-0.318	-0.365***	-0.353***	-0.122**	-0.078	-0.045	-0.360***	-0.351**
6	N/A	-3.364***	-0.201***	-0.129**	-0.073*	N/A	-3.324***	N/A	-3.399***	-0.198***	-0.116**	-0.058	N/A	-3.356***
7	N/A	-4.589***	-0.438***	-0.296***	-0.186***	N/A	-4.523***	N/A	-4.624***	-0.435***	-0.283***	-0.171***	N/A	-4.556***
10	0.073	-4.207***	-0.377***	-0.265***	-0.174***	0.279	-3.861***	0.040**	-4.242***	-0.373***	-0.252***	-0.159***	0.248	-3.894***
15	0.214	-3.982***	-0.392***	-0.272***	-0.170***	0.474	-3.583***	0.181	-4.017***	-0.388***	-0.259***	-0.155***	0.442	-3.615***
$\tau_1 = 1$														
τ_2	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)							
1	-0.005	-0.005	0.049	0.054**	0.045**	-0.013	-0.013							
2	-0.145**	-0.140	-0.005	0.021	0.031*	-0.150*	-0.146							
3	-0.127**	-0.123	-0.042	-0.020	-0.005	-0.129*	-0.125							
4	-0.128**	-0.124	-0.057	-0.031	-0.012	-0.137*	-0.134							
5	-0.247***	-0.240*	-0.086	-0.053	-0.027	-0.252***	-0.247							
6	N/A	-3.285***	-0.162**	-0.091	-0.040	N/A	-3.252***							
7	N/A	-4.510***	-0.399***	-0.258***	-0.153**	N/A	-4.451***							
10	0.158	-4.128***	-0.337***	-0.227***	-0.141*	0.356	-3.789***							
15	0.299	-3.903***	-0.352***	-0.234***	-0.137*	0.550**	-3.511***							

Notes: N/A indicates no CAR is applicable. The nearby log-returns, nearby simple returns, third-deferred, sixth-deferred, twelfth-deferred futures returns, the spot log-returns, and the spot simple returns stand for F1 (L), F1 (S), F2, F3, F4, Spot (L), and Spot (S), respectively. The t -statistic proposed Patell (1976) is adopted here.

*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. No log-returns could be calculated on April 20, 2020 ($\tau_2 = 6$) and April 21, 2020 ($\tau_2 = 7$) in WTI crude oil futures and spot markets, respectively.

Table B3: Cumulative abnormal returns (CARs) for Brent crude oil markets: Truce of the oil price war.

$\tau_1 = -5$							$\tau_1 = -4$							
τ_2	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)
-5	0.175***	0.194***	0.060**	0.027	0.012	0.284***	0.335***							
-4	0.323***	0.350***	0.135***	0.073***	0.038	0.490***	0.558***	0.147***	0.156***	0.075***	0.046**	0.026	0.206***	0.223***
-3	0.224***	0.251***	0.072***	0.022	0.002	0.334***	0.405***	0.049**	0.056***	0.012	-0.005	-0.009	0.050**	0.071*
-2	0.175***	0.202***	0.064***	0.024	0.010	0.299***	0.371***	0.000	0.008*	0.004	-0.003	-0.001	0.015	0.036
-1	0.179***	0.207***	0.043**	0.003	-0.011	0.401***	0.483***	0.004	0.013**	-0.017	-0.024	-0.023	0.117***	0.148**
0	0.117***	0.146***	0.014**	-0.016	-0.024	0.157***	0.262***	-0.058	-0.049	-0.046	-0.042	-0.036	-0.127	-0.072
1	0.135***	0.163***	0.056***	0.028	0.010	N/A	N/A	-0.041	-0.032	-0.004	0.001	-0.002	N/A	N/A
2	0.034***	0.065***	0.013**	-0.001	-0.006	0.205***	0.313***	-0.141	-0.130	-0.047	-0.027	-0.018	-0.079	-0.022
3	-0.005***	0.026***	-0.025	-0.039	-0.041	0.146***	0.256***	-0.180	-0.168	-0.085	-0.066	-0.052	-0.138	-0.078
4	-0.003***	0.029***	-0.028	-0.041	-0.039	0.087***	0.199***	-0.178	-0.166	-0.087	-0.067	-0.051	-0.197	-0.136
5	-0.026***	0.005***	-0.059	-0.066	-0.058	0.103***	0.218***	-0.201	-0.189	-0.119	-0.093	-0.070	-0.180	-0.117
6	-0.107***	-0.072***	-0.091	-0.076	-0.056	-0.008***	0.113***	-0.282	-0.266	-0.151	-0.103	-0.068	-0.292	-0.221
7	-0.348	-0.279**	-0.242	-0.193	-0.138*	-0.604	-0.316***	-0.523***	-0.474***	-0.302***	-0.219***	-0.150**	-0.887***	-0.651**
10	-0.277*	-0.206***	-0.226	-0.193	-0.145*	-0.085***	0.306***	-0.452***	-0.401***	-0.286***	-0.219**	-0.156**	-0.369	-0.028
15	-0.131***	-0.048***	-0.226	-0.200*	-0.151*	0.053***	0.455***	-0.306**	-0.243	-0.286***	-0.227***	-0.163**	-0.230	0.121
$\tau_1 = -3$							$\tau_1 = -2$							
τ_2	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)
-3	-0.099***	-0.099***	-0.063**	-0.051**	-0.036*	-0.156***	-0.152**							
-2	-0.148***	-0.148***	-0.071***	-0.049**	-0.028	-0.192***	-0.187***	-0.049	-0.048	-0.008	0.002	0.008	-0.035	-0.035
-1	-0.143***	-0.143***	-0.092***	-0.070***	-0.049**	-0.089***	-0.075*	-0.044	-0.043	-0.029	-0.019	-0.013	0.067	0.077
0	-0.205***	-0.204***	-0.121***	-0.088***	-0.062***	-0.333***	-0.296***	-0.106**	-0.105***	-0.059	-0.038	-0.026	-0.177**	-0.143
1	-0.188***	-0.187***	-0.079***	-0.045**	-0.028*	N/A	N/A	-0.089**	-0.088**	-0.016	0.006	0.008	N/A	N/A
2	-0.288***	-0.285***	-0.122***	-0.073***	-0.045**	-0.285***	-0.245***	-0.189***	-0.186***	-0.059	-0.023	-0.009	-0.129*	-0.093
3	-0.328***	-0.324***	-0.160***	-0.112***	-0.079***	-0.344***	-0.302***	-0.229***	-0.224***	-0.097**	-0.061	-0.043	-0.188**	-0.149
4	-0.325***	-0.321***	-0.163***	-0.113***	-0.078***	-0.403***	-0.359***	-0.226***	-0.222***	-0.100**	-0.063	-0.042	-0.247***	-0.207*
5	-0.348***	-0.345***	-0.194***	-0.139***	-0.096***	-0.387***	-0.340***	-0.250***	-0.245***	-0.131**	-0.088*	-0.061	-0.231***	-0.188
6	-0.429***	-0.422***	-0.226***	-0.149***	-0.094***	-0.498***	-0.444***	-0.330***	-0.322***	-0.163***	-0.098*	-0.058	-0.342***	-0.292**
7	-0.671***	-0.629***	-0.377***	-0.265***	-0.176***	-1.094***	-0.874***	-0.572***	-0.530***	-0.314***	-0.215***	-0.141***	-0.938***	-0.721***
10	-0.599***	-0.556***	-0.361***	-0.265***	-0.183***	-0.575***	-0.251***	-0.501***	-0.457***	-0.298***	-0.215***	-0.147***	-0.419***	-0.099
15	-0.454***	-0.398***	-0.361***	-0.273***	-0.189***	-0.437***	-0.103***	-0.355***	-0.299***	-0.222***	-0.153***	-0.281***	0.050	

Continued

$\tau_1 = -1$							$\tau_1 = 0$							
τ_2	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)
-1	0.005	0.005	-0.021	-0.021	-0.021	0.102**	0.112*							
0	-0.058	-0.057	-0.051	-0.040	-0.034	-0.141	-0.108	-0.062**	-0.061**	-0.030	-0.018	-0.013	-0.244***	-0.220***
1	-0.040	-0.040	-0.008	0.004	0.000	N/A	N/A	-0.045	-0.045	0.013	0.025	0.021	N/A	N/A
2	-0.141***	-0.138***	-0.051	-0.025	-0.017	-0.094	-0.058	-0.145***	-0.143***	-0.031	-0.004	0.004	-0.196***	-0.170***
3	-0.180***	-0.176***	-0.089**	-0.063*	-0.051*	-0.153	-0.114	-0.185***	-0.181***	-0.068*	-0.042	-0.030	-0.255***	-0.226***
4	-0.178***	-0.174***	-0.092**	-0.065*	-0.050*	-0.212**	-0.172	-0.182***	-0.179***	-0.071*	-0.044	-0.029	-0.314***	-0.284***
5	-0.201***	-0.197***	-0.123***	-0.090**	-0.069**	-0.195**	-0.153	-0.205***	-0.202***	-0.102**	-0.069	-0.047	-0.297***	-0.265***
6	-0.281***	-0.274***	-0.156***	-0.100**	-0.066**	-0.307***	-0.257*	-0.286***	-0.279***	-0.135***	-0.079*	-0.045	-0.409***	-0.369***
7	-0.523***	-0.482***	-0.306***	-0.217***	-0.149***	-0.902***	-0.687***	-0.528***	-0.487***	-0.285***	-0.196***	-0.127***	-1.004***	-0.799***
10	-0.452***	-0.409***	-0.290***	-0.216***	-0.155***	-0.384***	-0.064	-0.456***	-0.413***	-0.270***	-0.195***	-0.134***	-0.486***	-0.176***
15	-0.306***	-0.251***	-0.290***	-0.224***	-0.161***	-0.245***	0.085	-0.310***	-0.255***	-0.269***	-0.203***	-0.140***	-0.347***	-0.027***
$\tau_1 = 1$														
τ_2	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)							
1	0.017	0.017	0.042*	0.043*	0.034*	N/A	N/A							
2	-0.083*	-0.081*	-0.001	0.015	0.018	0.048	0.051							
3	-0.122**	-0.120**	-0.039	-0.024	-0.017	-0.011	-0.006							
4	-0.120**	-0.117**	-0.041	-0.025	-0.015	-0.070	-0.063							
5	-0.143***	-0.141***	-0.073	-0.051	-0.034	-0.054	-0.044							
6	-0.224***	-0.218***	-0.105	-0.061	-0.032	-0.165	-0.149							
7	-0.465***	-0.425***	-0.256***	-0.177***	-0.114*	-0.761***	-0.578***							
10	-0.394***	-0.352***	-0.240***	-0.177***	-0.121**	-0.242***	0.044							
15	-0.248***	-0.194***	-0.240***	-0.184***	-0.127**	-0.104*	0.193							

Notes: N/A indicates no CAR is applicable. The nearby log-returns, nearby simple returns, third-deferred, sixth-deferred, twelfth-deferred futures returns, the spot log-returns, and the spot simple returns are stand for F1 (L), F1 (S), F2, F3, F4, Spot (L), and Spot (S), respectively. The t -statistic proposed Patell (1976) is adopted here. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. No data are available in Brent crude oil spot market on April 10, 2020 ($\tau_2 = 1$).

Table B4: Cumulative abnormal returns (CARs) for Oman crude oil markets: Truce of the oil price war.

$\tau_1 = -5$								$\tau_1 = -4$							
τ_2	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)	
-5	0.146***	0.160***	0.058**	0.027	0.012	-0.004	-0.002								
-4	0.350***	0.382***	0.182***	0.112***	0.067**	0.140**	0.145*	0.204***	0.223***	0.124***	0.085***	0.055**	0.144***	0.147***	
-3	0.205***	0.238***	0.062***	0.005	-0.017	0.067	0.082	0.059***	0.079***	0.004	-0.022	-0.029	0.071**	0.084*	
-2	0.063***	0.104***	-0.014	-0.050	-0.060	0.052	0.068	-0.084	-0.056	-0.072	-0.077	-0.072	0.056**	0.070*	
-1	0.080***	0.122***	-0.010	-0.062	-0.082	-0.045	-0.023	-0.066	-0.038	-0.068	-0.089	-0.094*	-0.040	-0.021	
0	-0.032***	0.014***	-0.079	-0.115	-0.124**	-0.076	-0.052	-0.178	-0.146	-0.137	-0.142**	-0.136***	-0.072	-0.050	
1	0.034***	0.081***	0.054**	0.008	-0.018	-0.106	-0.083	-0.112	-0.079	-0.004	-0.019	-0.030	-0.102	-0.081	
2	-0.118*	-0.065***	-0.045	-0.064	-0.073	-0.173	-0.145	-0.264	-0.224	-0.104	-0.091	-0.085	-0.169	-0.143	
3	-0.078**	-0.025***	0.006	-0.020	-0.034	-0.229	-0.203	-0.224	-0.185	-0.052	-0.047	-0.046	-0.225	-0.201	
4	-0.081**	-0.028***	0.000	-0.023	-0.032	-0.230	-0.203	-0.227	-0.188	-0.058	-0.051	-0.044	-0.226	-0.201	
5	-0.060**	-0.006***	-0.002	-0.025	-0.032	-0.215	-0.182	-0.206	-0.166	-0.060	-0.053	-0.044	-0.211	-0.180	
6	-0.097**	-0.043***	-0.047	-0.043	-0.029	-0.197	-0.167	-0.243	-0.202	-0.105	-0.070	-0.041	-0.193	-0.165	
7	-0.228	-0.162**	-0.121	-0.090	-0.051	-0.319**	-0.282	-0.374**	-0.321	-0.179	-0.117	-0.063	-0.315	-0.280	
10	-0.224	-0.141**	-0.191	-0.157	-0.110	-0.318**	-0.201	-0.370**	-0.300	-0.249*	-0.184**	-0.122*	-0.314	-0.199	
15	0.007**	0.127***	-0.099	-0.089	-0.052	N/A	N/A	-0.139	-0.032	-0.157	-0.117	-0.064	N/A	N/A	
$\tau_1 = -3$								$\tau_1 = -2$							
τ_2	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)	
-3	-0.145***	-0.144***	-0.121***	-0.107***	-0.083***	-0.073*	-0.064								
-2	-0.288***	-0.278***	-0.197***	-0.162***	-0.127***	-0.088**	-0.078	-0.142***	-0.134***	-0.076***	-0.055**	-0.043*	-0.015	-0.014	
-1	-0.270***	-0.260***	-0.192***	-0.174***	-0.148***	-0.184***	-0.168**	-0.125***	-0.117***	-0.071**	-0.067**	-0.065***	-0.111**	-0.105	
0	-0.382***	-0.368***	-0.262***	-0.227***	-0.191***	-0.216***	-0.197**	-0.237***	-0.225***	-0.141***	-0.120***	-0.108***	-0.143***	-0.134*	
1	-0.316***	-0.301***	-0.128***	-0.104***	-0.085***	-0.246***	-0.229***	-0.171***	-0.158***	-0.008	0.003	-0.002	-0.173***	-0.165**	
2	-0.468***	-0.447***	-0.228***	-0.176***	-0.140***	-0.312***	-0.291***	-0.323***	-0.303***	-0.107***	-0.069**	-0.057**	-0.240***	-0.227**	
3	-0.428***	-0.407***	-0.176***	-0.132***	-0.100***	-0.369***	-0.348***	-0.283***	-0.264***	-0.056**	-0.025*	-0.017*	-0.296***	-0.284***	
4	-0.431***	-0.410***	-0.182***	-0.135***	-0.099***	-0.369***	-0.349***	-0.286***	-0.267***	-0.062**	-0.028*	-0.016*	-0.297***	-0.285***	
5	-0.410***	-0.389***	-0.185***	-0.137***	-0.098***	-0.355***	-0.328***	-0.265***	-0.245***	-0.064**	-0.030*	-0.015*	-0.282***	-0.264***	
6	-0.447***	-0.425***	-0.229***	-0.154***	-0.096***	-0.337***	-0.313***	-0.302***	-0.281***	-0.109***	-0.047**	-0.012*	-0.264***	-0.249***	
7	-0.578***	-0.544***	-0.303***	-0.201***	-0.118***	-0.459***	-0.428***	-0.432***	-0.400***	-0.183***	-0.094***	-0.035**	-0.386***	-0.364***	
10	-0.574***	-0.523***	-0.373***	-0.269***	-0.176***	-0.458***	-0.346***	-0.428***	-0.379***	-0.253***	-0.162***	-0.093***	-0.385***	-0.282***	
15	-0.343***	-0.255***	-0.282***	-0.201***	-0.119***	N/A	N/A	-0.198***	-0.111***	-0.161***	-0.094***	-0.036**	N/A	N/A	

Continued

$\tau_1 = -1$							$\tau_1 = 0$							
τ_2	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)
-1	0.017	0.018	0.005	-0.012	-0.022	-0.096***	-0.091							
0	-0.095*	-0.090*	-0.065	-0.065*	-0.064**	-0.128***	-0.120**	-0.112***	-0.108***	-0.070***	-0.053**	-0.043**	-0.032	-0.029
1	-0.029	-0.023	0.068	0.058	0.042	-0.158***	-0.151**	-0.046*	-0.041*	0.064	0.070	0.063	-0.062	-0.060
2	-0.181***	-0.169***	-0.031	-0.014	-0.013	-0.225***	-0.213***	-0.198***	-0.186***	-0.036	-0.002	0.008	-0.128**	-0.122
3	-0.141**	-0.129**	0.020	0.030	0.026	-0.281***	-0.270***	-0.158***	-0.147***	0.016	0.042	0.048	-0.185***	-0.180**
4	-0.144**	-0.132**	0.014	0.027	0.028	-0.281***	-0.271***	-0.161***	-0.150***	0.010	0.039	0.050	-0.185***	-0.180**
5	-0.123**	-0.110**	0.012	0.025	0.028	-0.267***	-0.250***	-0.140***	-0.128***	0.007	0.037	0.050	-0.171***	-0.160*
6	-0.159**	-0.147**	-0.032	0.007	0.031	-0.249***	-0.235***	-0.177***	-0.164***	-0.037	0.019	0.053	-0.153***	-0.145*
7	-0.290***	-0.266***	-0.106	-0.039	0.009	-0.371***	-0.350***	-0.308***	-0.283***	-0.111*	-0.028	0.031	-0.275***	-0.260***
10	-0.286***	-0.245***	-0.177**	-0.107	-0.049	-0.370***	-0.269***	-0.304***	-0.263***	-0.181***	-0.095	-0.028	-0.274***	-0.178**
15	-0.056**	0.023	-0.085	-0.039	0.008	N/A	N/A	-0.073***	0.005***	-0.090**	-0.028	0.030	N/A	N/A
$\tau_1 = 1$														
τ_2	F1 (L)	F1 (S)	F2	F3	F4	Spot (L)	Spot (S)							
1	0.066*	0.067**	0.133***	0.123***	0.106***	-0.030**	-0.031							
2	-0.086	-0.078	0.034**	0.051***	0.051***	-0.097*	-0.093							
3	-0.046	-0.039	0.085***	0.095***	0.091***	-0.153	-0.151**							
4	-0.049	-0.042	0.079***	0.092***	0.092***	-0.153	-0.151**							
5	-0.028	-0.020	0.077***	0.090***	0.093***	-0.139	-0.130*							
6	-0.065	-0.056	0.032***	0.073***	0.096***	-0.121	-0.115*							
7	-0.196**	-0.175*	-0.042	0.026***	0.073***	-0.243	-0.230**							
10	-0.192**	-0.154	-0.112	-0.042*	0.015***	-0.242	-0.149**							
15	0.039	0.113	-0.020	0.026***	0.072***	N/A	N/A							

Notes: N/A indicates no CAR is applicable. The nearby log-returns, nearby simple returns, third-deferred, sixth-deferred, twelfth-deferred futures returns, the spot returns log-returns, and the spot simple returns are stand for F1 (L), F1 (S), F2, F3, F4, Spot (L), and Spot (S), respectively. The t -statistic proposed Patell (1976) is adopted here.

*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. No data are available in Oman crude oil spot market on May 1, 2020 ($\tau_2 = 15$).